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Atty. Docket No. KOV-015
Serial No: 10/722,255

Amendments to the Claims

Please cancel claims 49-80, add new claims 82-112, and amend the remaining claims as follows:

1. (Currently Amended) A method of repairing a circuit, comprising the steps of:
   a) depositing a thin film composition comprising nanoparticles of at least one electrically functional material on or over a region of said circuit to be repaired such that said thin film composition contacts first and second elements of said circuit; ~~and~~
   b) irradiating at least a portion of the thin film composition with a wavelength of light for a length of time and at an intensity sufficient to convert said nanoparticles to an electronically functional film, fuse said nanoparticles or bind said nanoparticles to each other; and
   c) locally rinsing said irradiated thin film with a developer to remove non-irradiated portions or portions adjacent to the irradiated portion of the composition.

2. (Currently Amended) The method of Claim 1, wherein said length of time is sufficient to convert said thin film composition into ~~an~~ said electronically functional thin film.

3. (Original) The method of Claim 1, wherein a source of said light comprises a laser.

4. (Original) The method of Claim 1, wherein said nanoparticles comprise metal nanoparticles.

5. (Original) The method of Claim 1, wherein said composition further comprises a sensitizer configured to selectively absorb said wavelength of said light.

6. (Original) The method of Claim 5, wherein said light has a bandwidth of 40 nm or less.

7. (Original) The method of Claim 1, wherein said light consists essentially of infrared light with an emission maximum of from about 800 to about 850 nm.

8. (Original) The method of Claim 1, wherein said light has properties and said wavelength has a penetration depth such that illumination intensity at an interface between said thin film composition and said first and second elements of said circuit is sufficiently high to convert said nanoparticles near the interface to an electronically functional film.

9. (Original) The method of Claim 8, wherein said intensity at the interface is > 25% of an incident intensity.

10. (Original) The method of Claim 1, wherein at least one circuit component absorbs said wavelength of light at an efficiency sufficiently low to prevent detrimental effects to said component or an adjacent component.

11. (Original) The method of Claim 1, wherein said nanoparticles comprise a precursor to a semiconducting film.

12. (Original) The method of Claim 1, wherein said nanoparticles comprise a precursor to a dielectric film.

13. (Currently Amended) The method of Claim [[1]]45, further comprising the step of developing said irradiated thin film to remove non-irradiated portions or portions adjacent to the irradiated portion of the composition.

14. (Original) The method of Claim 1, further comprising, prior to said depositing step, the step of exposing the first and second circuit elements.

15. (Original) The method of Claim 14, wherein said exposing step comprises laser ablation.

16. (Original) The method of Claim 14, further comprising, after said exposing step and prior to said depositing step, the step of preparing a surface of said first and second circuit elements for said depositing.

17. (Original) The method of Claim 16, wherein said preparing step comprises cleaning said surface of said first and second circuit elements.

18. (Original) The method of Claim 1, further comprising covering a repair area formed by said irradiated thin film composition with a coating, passivation or capping material.

19. (Original) The method of Claim 18, wherein said covering step comprises dispensing a liquid precursor onto said repair area, said liquid precursor forming said coating, passivation or capping material upon further treatment or processing.

20. (Original) The method of Claim 19, wherein said covering step further comprises laser curing said liquid precursor.

21. (Original) The method of Claim 19, wherein said liquid precursor comprises a polyimide, spin on glass, polysesquiloxane, or PDMS.

22. (Original) The method of Claim 21, wherein said liquid precursor comprises said polyimide and a thermal sensitizer.

23. (Original) The method of Claim 13, wherein said developing step comprises locally rinsing said irradiated thin film with a developer.

24. (Original) The method of Claim 23, wherein said developer comprises an organic solvent.

25. (Original) The method of Claim 24, wherein said developer comprises a member selected from the group consisting of toluene, butyl ether, xylene, 3-octanol and terpinol.

26. (Currently Amended) ~~The~~ A method of ~~Claim 13~~ repairing a circuit, comprising the steps of:

a) depositing a thin film composition comprising nanoparticles of at least one electrically functional material on or over a region of said circuit to be repaired such that said thin film composition contacts first and second elements of said circuit;

b) irradiating at least a portion of the thin film composition with a wavelength of light for a length of time and at an intensity sufficient to convert said nanoparticles to an electronically functional film, fuse said nanoparticles or bind said nanoparticles to each other; and

c) ~~where the developing step comprises~~ exposing the irradiated and non-irradiated portions of the composition to a solvent which dissolves portions of the composition in which said nanoparticles are not fused, bound to each other or the substrate, or converted to ~~an~~ said electronically functional film.

27. (Currently Amended) ~~The~~ A method of ~~Claim 13~~ repairing a circuit, comprising the steps of:

a) depositing a thin film composition comprising nanoparticles of at least one electrically functional material on or over a region of said circuit to be repaired such that said thin film composition contacts first and second elements of said circuit;

b) irradiating at least a portion of the thin film composition with a wavelength of light for a length of time and at an intensity sufficient to convert said

nanoparticles to an electronically functional film, fuse said nanoparticles or bind said nanoparticles to each other; and

c) ~~where the developing step comprises~~ exposing the irradiated and non irradiated portions of the composition to a jet of particles.

28. (Original) The method of Claim 27, wherein the particles rapidly convert into a gas, enhancing the removal of material from the non-irradiated portions of the composition.

29. (Original) The method of Claim 27, wherein said jet of particles comprises dry ice (solid carbon dioxide).

30. (Original) The method of Claim 1, further comprising flowing a gas towards or away from the irradiated portion sufficiently to remove one or more by-products of the irradiating step.

31. (Original) The method of Claim 1, further comprising, prior to said irradiating step, the steps of placing said substrate into a chamber, evacuating said chamber, and passing an inert and/or reducing gas into said chamber.

32. (Original) The method of Claim 1, further comprising heating said irradiated portion of said thin film composition.

33. (Original) The method of Claim 32, wherein said heating comprises flowing heated gas over said irradiated portion of said thin film composition.

34. (Original) The method of Claim 32, further comprising the step of post-thermal processing the irradiated portion of said thin film composition.

35. (Original) The method of Claim 34, wherein said post thermal processing comprises exposing said irradiated portion of said thin film composition to radiation.

36. (Original) The method of Claim 35, wherein said post thermal processing comprises locally exposing said irradiated portion of said thin film composition to radiation.

37. (Original) The method of Claim 35, wherein said radiation is provided by a laser.

38. (Original) The method of Claim 35, wherein said radiation has a wavelength of less than 500 nanometers.

39. (Original) The method of Claim 35, wherein said post thermal processing is conducted sufficiently to improve a conductivity of the irradiated portion of said thin film composition.

40. (Original) The method of Claim 35, wherein said post thermal processing is conducted sufficiently to improve adhesion of the irradiated portion of said thin film composition to an underlying or adjacent layer.

41. (Original) The method of Claim 35, wherein said post thermal processing is conducted sufficiently to relax a stress and/or improve a morphology or profile of said irradiated portion of said thin film composition.

42. (Original) The method of Claim 1, further comprising examining or testing said circuit to find and/or locate said region to be repaired.

43. (Original) The method of Claim 42, further comprising fabricating a circuit or circuit element prior to said examining or testing step.

44. (Original) The method of Claim 43, wherein each of said fabricating, said examining or testing, said depositing and said irradiating steps are performed by a single tool.

45. (Currently Amended) A method of repairing a circuit, comprising the steps of:

a) depositing a thin film composition comprising a solution precursor to a semiconducting material on or over a region of said circuit to be repaired such that said thin film composition contacts at least one element of said circuit; and

b) irradiating at least a portion of the thin film composition with a wavelength of light for a length of time and at an intensity sufficient to convert said solution precursor to an electronically functional film, convert said solution precursor to a corresponding oxide and/or nitride, or make said solution precursor insoluble in a subsequent developing step, thereby adding a new semiconducting element to the circuit.

46. (Original) The method of Claim 45, wherein the solution precursor includes a silane.

47. (Currently Amended) The method of Claim [[45]]48, wherein the method repairs a circuit by adding a new semiconducting element to the circuit.

48. (Currently Amended) ~~The~~ A method of ~~Claim 45~~repairing a circuit, ~~further~~ comprising the steps of:

a) depositing a thin film composition comprising a solution precursor to a semiconducting material on or over a region of said circuit to be repaired such that said thin film composition contacts at least one element of said circuit;

b) irradiating at least a portion of the thin film composition with a wavelength of light for a length of time and at an intensity sufficient to convert said solution precursor to an electronically functional film, convert said solution precursor to a corresponding oxide and/or nitride, or make said solution precursor insoluble in a subsequent developing step; and

c) oxidizing or nitriding the deposited thin film composition sufficiently to produce an insulating feature.

49-80. (Canceled)

81. (Currently Amended) ~~The~~ A method of ~~Claim 79~~repairing a circuit, ~~wherein said patterning~~ comprising the steps of~~comprises~~:

a) dispensing a liquid low surface energy thin film precursor onto ~~said~~ a region of said circuit to be repaired;

b) exposing the liquid low surface energy thin film precursor to laser radiation such that the low surface energy thin film material is fixed to a surface of said region other than an area where ~~the nanoparticle~~ a thin film composition comprising nanoparticles of at least one electrically functional material is to be deposited; ~~and~~

c) developing the liquid low surface energy thin film precursor and the high surface energy thin film material to remove the unexposed liquid high surface energy thin film precursor;

d) depositing the thin film composition on or over the region of said circuit to be repaired such that said thin film composition contacts first and second elements of said circuit; and

e) converting said nanoparticles to an electronically functional film.

82. (New) The method of Claim 81, wherein converting said nanoparticles comprises irradiating the thin film composition.

83. (New) The method of Claim 82, wherein said nanoparticles are irradiated with a wavelength and/or intensity of light generally sufficient to improve adhesion of the electronically functional thin film to an underlying or adjacent layer.

84. (New) The method of Claim 81, wherein converting said nanoparticles comprises heating the thin film composition.

85. (New) The method of Claim 26, wherein said length of time is sufficient to convert said thin film composition into said electronically functional thin film.

86. (New) The method of Claim 26, wherein a source of said light comprises a laser.

87. (New) The method of Claim 26, wherein said nanoparticles comprise metal nanoparticles.

88. (New) The method of Claim 26, wherein said light consists essentially of infrared light with an emission maximum of from about 800 to about 850 nm.

89. (New) The method of Claim 26, wherein said nanoparticles comprise a precursor to a semiconducting film.

90. (New) The method of Claim 26, wherein said nanoparticles comprise a precursor to a dielectric film.

91. (New) The method of Claim 26, further comprising, prior to said depositing step, the step of exposing the first and second circuit elements.

92. (New) The method of Claim 26, further comprising covering a repair area formed by said irradiated thin film composition with a coating, passivation or capping material.

93. (New) The method of Claim 26, wherein said step of exposing the irradiated and non-irradiated portions of the composition to said solvent comprises locally rinsing said irradiated thin film with a developer.

94. (New) The method of Claim 93, wherein said developer comprises an organic solvent.

95. (New) The method of Claim 94, wherein said developer comprises a member selected from the group consisting of toluene, butyl ether, xylene, 3-octanol and terpinol.

96. (New) The method of Claim 26, further comprising, prior to said irradiating step, the steps of placing said substrate into a chamber, evacuating said chamber, and passing an inert and/or reducing gas into said chamber.

97. (New) The method of Claim 26, further comprising heating said irradiated portion of said thin film composition.

98. (New) The method of Claim 97, further comprising post thermal processing said irradiated portion of said thin film composition to sufficient radiation having a wavelength of less than 500 nanometers to improve a conductivity of the irradiated portion of said thin film composition, improve adhesion of the irradiated portion of said thin film composition to an underlying or adjacent layer, and/or relax a stress and/or improve a morphology or profile of said irradiated portion of said thin film composition.

99. (New) The method of Claim 26, further comprising examining or testing said circuit to find and/or locate said region to be repaired.

100. (New) The method of Claim 99, wherein each of said examining or testing, said depositing and said irradiating steps are performed by a single tool.

101. (New) The method of Claim 27, wherein said length of time is sufficient to convert said thin film composition into said electronically functional thin film.

102. (New) The method of Claim 27, wherein said nanoparticles comprise metal nanoparticles.

103. (New) The method of Claim 27, wherein said nanoparticles comprise a precursor to a semiconducting film.

104. (New) The method of Claim 27, wherein said nanoparticles comprise a precursor to a dielectric film.

105. (New) The method of Claim 27, further comprising, prior to said depositing step, the step of exposing the first and second circuit elements.

106. (New) The method of Claim 27, further comprising covering a repair area formed by said irradiated thin film composition with a coating, passivation or capping material.

107. (New) The method of Claim 27, further comprising, prior to said irradiating step, the steps of placing said substrate into a chamber, evacuating said chamber, and passing an inert and/or reducing gas into said chamber.

108. (New) The method of Claim 27, further comprising heating said irradiated portion of said thin film composition.

109. (New) The method of Claim 106, further comprising post thermal processing said irradiated portion of said thin film composition to sufficient radiation having a wavelength of less than 500 nanometers to improve a conductivity of the irradiated portion of said thin film composition, improve adhesion of the irradiated portion of said thin film composition to an underlying or adjacent layer, and/or relax a stress and/or improve a morphology or profile of said irradiated portion of said thin film composition.

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110. (New) The method of Claim 27, further comprising examining or testing said circuit to find and/or locate said region to be repaired.

111. (New) The method of Claim 110, wherein each of said examining or testing, said depositing and said irradiating steps are performed by a single tool.

112. (New) The method of Claim 48, wherein the solution precursor includes a silane.